




**MANYONI PRIVATE GAME RESERVE,
KWAZULU-NATAL**

VEGETATION REPORT

SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of Chapter 3 Section 13 of Government Notice No. R. 326 dated 7th April 2017 (Environmental Impact Assessment Regulations) under section 24(5), of the National Environmental Management Act, 1998 (Act 107 of 1998).

I, declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department Economic Development, Tourism and Environmental Affairs (EDTEA).

Signed: 

Date: 21-10-2017

Checked:

Date: 22-10-2017

MANYONI PRIVATE GAME RESERVE, KWAZULU-NATAL

VEGETATION REPORT UPDATE

Contents	Page
1. INTRODUCTION.....	4
2. PROJECT DESCRIPTION & MOTIVATION	5
3. REGULATIONS AND LEGISLATION	6
4. SAMPLING METHODOLOGY.....	6
• <i>Vegetation Sampling</i>	<i>6</i>
5. DESKTOP ASSESSMENT.....	7
• <i>SEA, C-Plan and CBA Biodiversity Features / Species within Project Area</i>	<i>7</i>
• <i>Bioresource Unit within the project</i>	<i>9</i>
• <i>ENPAT Data for the project area</i>	<i>10</i>
• <i>Vegetation Assessment</i>	<i>10</i>
▪ <i>Zululand Lowveld (SVI 23).....</i>	<i>11</i>
• <i>FEPA wetlands and / or rivers onsite.....</i>	<i>12</i>
6. VEGETATION ON SITE.....	12
• <i>General Vegetation Overview of the site</i>	<i>12</i>
7. DISCUSSION	16
8. SUMMARY OF FINDINGS	17
9. RECOMMENDATIONS AND CONCLUSIONS	17
10. REFERENCES	1
• NATIONAL ENVIRONMENTAL MANAGEMENT ACT, ACT NO. 107 OF 1998 (NEMA).....	3
• NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)	4
• NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO. 10 OF 2004).....	5
• CONSERVATION OF AGRICULTURAL RESOURCES (ACT NO. 43 OF 1983) AS AMENDED IN 2001	5
• EZEMVELO KZN WILDLIFE C-PLAN & SEA DATABASE	6
• BIO RESOURCE UNITS (BRU)	8

- ENVIRONMENTAL POTENTIAL ATLAS 8
- MUCINA AND RUTHERFORD’S VEGETATION ASSESSMENT AND
KWAZULU – NATAL VEGETATION TYPES (KZN VT)..... 9
- NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPA) ... 10

List of Tables **Page**

Table 1. SEA Data taken from Ezemvelo KZN Wildlife 7

Table 2. Minset / C-Plan Data taken from Ezemvelo KZN Wildlife 8

Table 3 Climate Table for Project Area 9

Table 4. Summary of CBA Categories (from *Ezemvelo KZN Wildlife, Biodiversity Spatial Planning Terms*)..... 7

List of Figures **Page**

Figure 1: Aerial Map of the Area 4

Figure 2: Locality Map of the Area 5

Figure 3: Proposed Lodge Layout 6

Figure 4: CBA Map of the Area. 8

Figure 5: BRU Map of the Area. 10

Figure 6: Mucina and Rutherford Vegetation Map of the Area 11

Figure 7: Thorn veld thickets supporting (top to bottom) *Ziziphus mucronata*, *Searsia gueinzii* and *Gymnosporia buxifolia*..... 13

Figure 8: *Schotia brachypetala* flowers and seed pods. 13

Figure 9: *Rhoicissus tridentata* and *Capparis tomentosa*..... 14

Figure 10: Stream on site. 14

Figure 11: (Clockwise from top left) *Pappea capensis*, *Justicia flava*, *Carissa bispinosa* and *Asparagus setaceous*. 15

Figure 12: *Sideroxylon inerme*. 15

MANYONI PRIVATE GAME RESERVE, KWAZULU-NATAL

VEGETATION REPORT UPDATE

1. INTRODUCTION

Ross Goode Ecological has been appointed by NatureStamp on behalf of Integrated Development Management Consultants (IDM), to conduct a Vegetation Assessment on Mayoni Private Game Reserve for the proposed development of a new lodge (Figure 1 and Figure 2).



Figure 1: Aerial Map of the Area

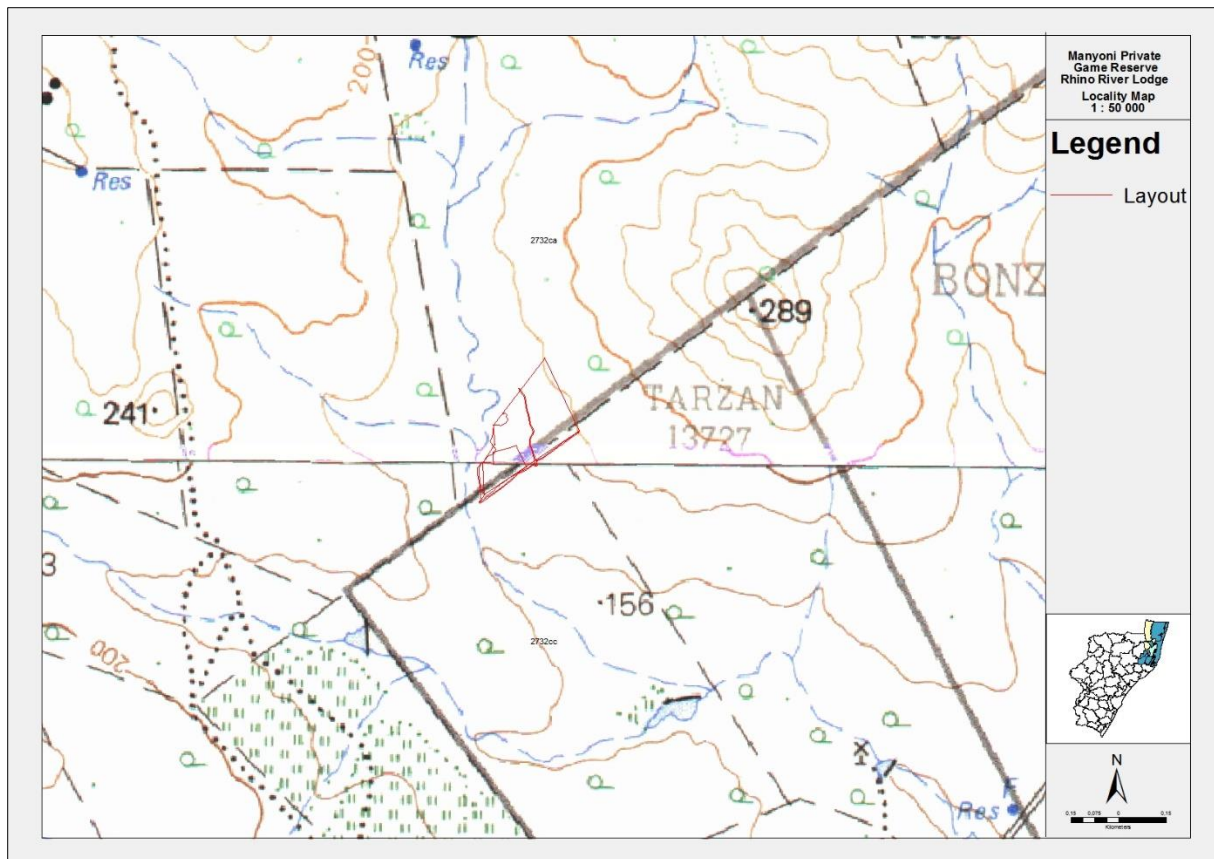


Figure 2: Locality Map of the Area

2. PROJECT DESCRIPTION & MOTIVATION

IDM require the undertaking of a vegetation assessment to determine the current ecological status of the proposed development site. The proposed development will comprise of a lodge with associated infrastructure such as ten (10) out-rooms, eating boma and swimming pool (**Figure 3**).

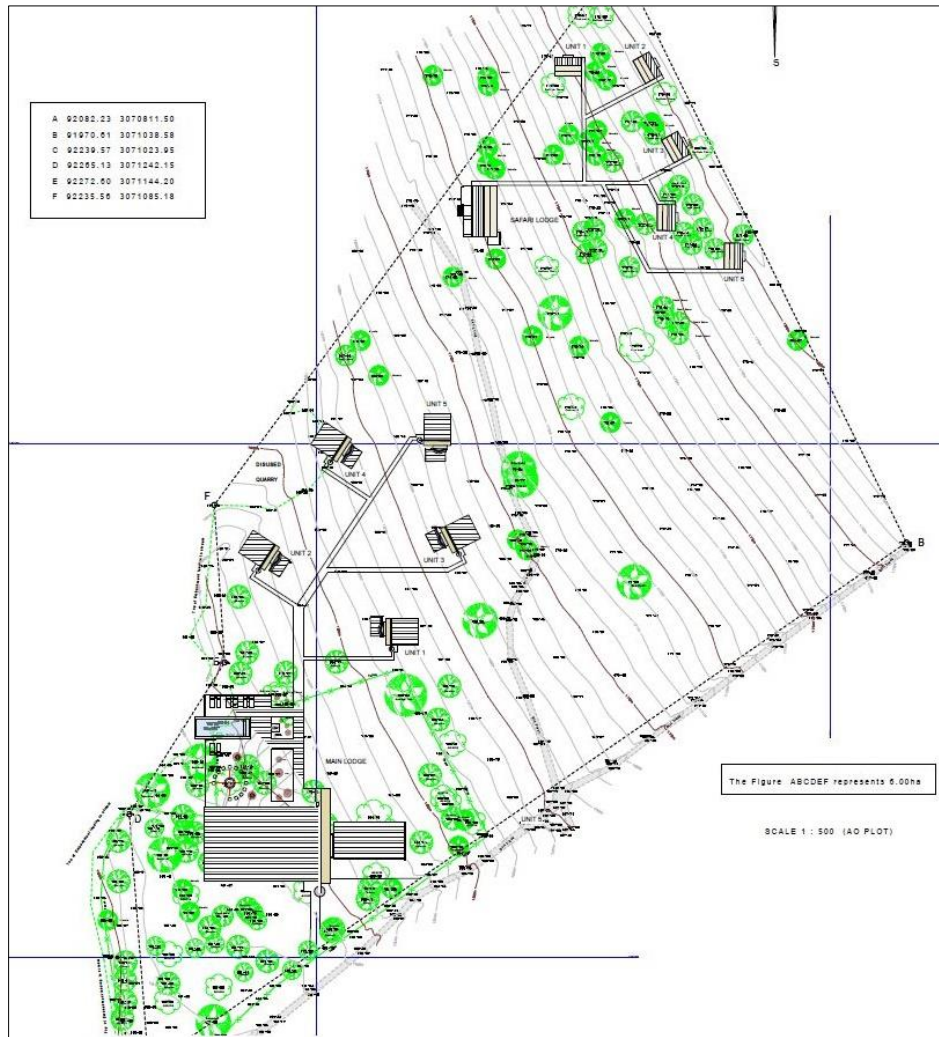


Figure 3: Proposed Lodge Layout

3. REGULATIONS AND LEGISLATION

There are a number of regulations and legislation governing this report and are listed below: The relevant sections of the regulations legislation are found in greater detail in Appendix 1.

- National Environmental Management Act, Act 108 of 1998 (NEMA) as amended in 2014
- National Forests Act (Act No. 84 of 1998)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- Conservation of Agricultural Resources (Act No. 43 of 1983) As Amended In 2001

4. SAMPLING METHODOLOGY

- *Vegetation Sampling*

A random vegetation transect procedure was employed. Individual plant species observed during the assessment were recorded to give an indication of species diversity and the overall species assemblage.

Please note that the intensity of the sampling procedure is prescribed by budgetary constraints. The sampling procedure proposed for this study is satisfactory for providing a general overview and rapid assessment of the plant diversity and assemblages that occur on site. This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment and to assess the possible impacts that may be imparted as a result of the proposed activities.

5. DESKTOP ASSESSMENT

A number of databases have been interrogated in the process of undertaking the Desktop Analysis, these include:

- Ezemvelo KwaZulu-Natal Wildlife’s C-Plan (Conservation Plan) and SEA (Strategic Environmental Assessment);
- Department of Agriculture’s (1998) Bioresource Classification for Kwazulu-Natal, South Africa;
- Department of Environmental Affairs and Tourism’s (2007) the Environmental Potential Atlas (ENPAT);
- Mucina and Rutherford’s Vegetation Assessment (2007);
- Ezemvelo KwaZulu-Natal Wildlife’s KwaZulu-Natal Vegetation Types (KZN VT);
- National Freshwater Ecosystem Priority Areas (NFEPA) (2010)

A summary of the methodology utilised for the generation of each of the databases are included in Appendix 2 for further interest. Below are the results of the Desktop assessment:

- *SEA, C-Plan and CBA Biodiversity Features / Species within Project Area*

In terms of the desktop analysis undertaken, part of the site traverses, irreplaceable1, i.e. These planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. (EIA very definitely required and depending on the nature of the proposal unlikely to be granted). While the majority of the site is classified as 0.005, i.e. all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site. The Minset analysis mirrors the C-Plan data with the area being deemed as not requiring protection.

There are several features present within the footprint which are considered to be of environmental significance and conservation importance. These features have been generated as a result of running the SEA data. These are included in **Table 1** below.

Table 1. SEA Data taken from Ezemvelo KZN Wildlife

YES	NO
Invertebrates	Forests
	Grasslands

YES	NO
	Mammals
	Birds
	Frogs
	Protected Plants
	Medicinal Plants
	Reptiles

In terms of the Minset/ C-Plan data generated, through the physical characteristics that are present on site, the species have been identified as potentially present on the site, and these groups are wholly significant in terms of conservation significance or parts thereof. **Table 2** below identifies which species are significant.

Table 2. Minset / C-Plan Data taken from Ezemvelo KZN Wildlife

SPECIES NAME	TYPE
<i>Diceros bicornis minor</i>	Mammal
<i>Zinophora laminata</i>	Millipede
<i>Edouardia conulus</i>	Mollusc

The CBA data (**Figure 4**) indicates that the site is largely CBA Irreplaceable, however during the ground truthing exercise it was found to be very disturbed and made up of pioneer and alien vegetation with a few protected plant species interspersed.



Figure 4: CBA Map of the Area.

- *Bioresource Unit within the project*

RSa1 - Pongola-Mkuze

The vegetation primarily consists of bushland. Of secondary importance is bushland thicket. There are only isolated areas of woodland.

The rainfall average is 605 mm per year. The mean temperature is 20.9 °C and the climate rating is C8: indicating that the local climate is restrictive due to the occurrence of high temperatures and l. Good yield potential for a moderate range of adapted crops. There is no frost hazard and the erosion rating for the site is 4.2, which translates to a high risk of erosion.

There are 9 perennial rivers. The names of these rivers include Mkuze, Mpalaza, Msebe, Msunduzi, Nkunzana, Pongolo, Sitilo and Spekboomrivier. There are also 3 non-perennial rivers. The names of these rivers include Mduna and Ntweni. There is also 1 undefined (the data does not indicate perennial or non-perennial) river.. Please note there are a number of drainage lines, non-perennial streams and wetlands that are not captured at the coarse level at which this data has been defined.

Table 3 Climate Table for Project Area

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RAINFALL													
Median rainfall (mm)	534	86	79	65	33	14	4	3	7	23	55	80	85
Mean rainfall (mm)	605	94	83	65	40	21	12	11	14	30	60	89	86
TEMPERATURE													
Average (degrees C)	20.9	24.8	24.5	23.7	21.4	18.7	16.0	16.0	17.8	19.9	21.2	22.4	24.1
Minimum (degrees C)	14.6	19.1	19.1	18.2	15.4	11.7	8.5	8.5	10.6	13.4	15.2	16.7	18.3
Maximum (degrees C)	27.3	30.5	30.0	29.4	27.5	25.7	23.6	23.7	25.1	26.5	27.3	28.1	29.9
SUNSHINE													
Hours/day (Oct-Mar)	6,8												
Mean annual (hours)	7,2												

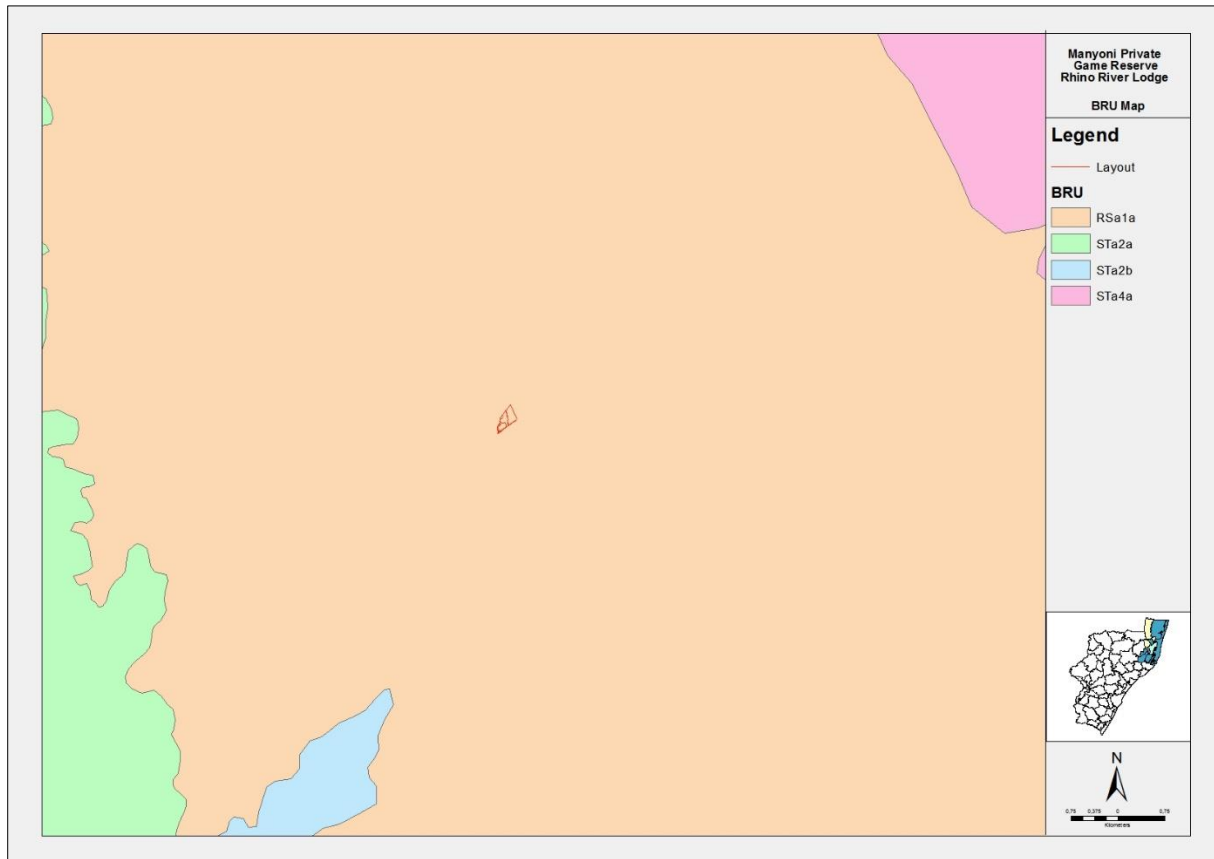


Figure 5: BRU Map of the Area.

- *ENPAT Data for the project area*

The ENPAT data provides the following information about the soils and geology for the site: The geology of the site is comprised of Basalt of the Letaba Formation, Lebombo Group, with small areas of alluvium. The soils are vertic, melanic, red structured diagnostic horizons, undifferentiated. The soils are of moderate to poor drainage and present an erosion hazard if not managed correctly (Department of Environmental Affairs and Tourism 2007).

- *Vegetation Assessment*

In terms of the vegetation on site, the general classification is made at a very coarse scale, i.e. low resolution and falls within the Zululand Lowveld (SVI 23) vegetation type.



Figure 6: Mucina and Rutherford Vegetation Map of the Area

- *Zululand Lowveld (SVI 23)*

Distribution: KwaZulu-Natal Province, Swaziland and Mpumalanga Province: Main extent from around Big Bend south to Mkuze, Hluhluwe, Ulundi to just north of the Ongoye Forest. An isolated patch is found on the Swaziland-Mpumalanga border. Altitude about 50 – 450m.

Conservation: Vulnerable. Target 19%. Some 11% statutorily conserved in the Hluhluwe-iMfolozi Park and Phongolapoort Nature Reserve. Almost 1% is protected in the private Masibekela Wetland. Much of the area between Magudu, Mkuze and Nongoma is managed as private game farms and lodges. About 26% of the area has been transformed, mostly by cultivation. Erosion is variable from high to low.

Important Taxa:

Tall Trees: *Acacia burkei*, *A. nigrescens*, *Sclerocarya birrea* subsp. *caffra*.

Small Trees: *Acacia tortilis* subsp. *heteracantha*, *A. gerrardii*, *A. natalitia*, *A. nilotica*, *A. Senegal* var. *rostrata*, *A. welwitschii* subsp. *welwitschii*, *Boscia albitrunca*, *Combretum apiculatum*, *C. molle*. *Ozoroa paniculosa*, *Phoenix reclinata*, *Schotia brachypetala*, *Spirostachys Africana*, *Teclea gerrardii*, *Ziziphus mucronata*.

Succulent Trees: *Aloe marlothii* subsp. *marlothii*, *Euphorbia grandidens*, *E. ingens*.

Tall shrubs: *Dichrostachys cinerea*, *Euclea divinorum*, *Coptosperma supra-axillare*, *Crotalaria monteiroi*, *Euclea crispa*, *E. schimperi*, *Galpinia transvaalica*, *Gardenia volkensii*, *Gymnosporia maranguensis*, *G. senegalensis*, *Jatropha zeyheri*, *Lycium acutifolium*, *Olea europaea* subsp. *africana*, *Tarchonanthus parvicapitulatus*, *Tephrosia polystachya*, *Triumfetta pilosa* var. *tomentosa*.

Low Shrubs: *Barleria obtusa*, *Crossandra greenstockii*, *Felicia muricata*, *Justicia flava*, *J. protracta* subsp. *protracta*, *Melhania didyma*, *Orthosiphon serratus*, *Pearsonia sessilifolia*, *Ruellia cordata*, *Sida serratifolia*, *Tetraselago natalensis*.

Succulent Shrubs: *Euphorbia grandicornis*, *E. trichadenia*, *E. vandermerwei*.

Soft Shrub: *Pavonia columella*.

Herbaceous Climber: *Fockea angustifolia*.

Graminoides: *Dactyloctenium austral*, *Enteropogon monostachyus*, *Eragrostis capensis*, *E. curvula*, *E. racemosa*, *Heteropogon contortus*, *Panicum maximum*, *Sporobolus pyramidalis*, *Themeda triandra*, *Aristida bipartite*, *A. congesta*, *Bothriochloa insculpta*, *Chloris mossambicensis*, *Cymbopogon caesius*, *Digitaria natalensis*, *Leptochloa eleusine*, *Panicum deustum*, *Schizachyrium sanguineum*, *Setaria incrassate*, *Sporobolus nitens*, *Trachypogon spicatus*, *Tristachya leucothrix*.

Herbs: *Acrotome hispida*, *Argyrolobium rupestre*, *Aspilia mossambicensis*, *Chamaecrista biensis*, *C. mimosoides*, *Corchorus asplenifolius*, *Felicia mossamedensis*, *Gerbera ambigua*, *Helichrysum rugulosum*, *Hibiscus pusillus*, *Kohautia virgate*, *Lotononis eriantha*, *Senecio latifolius*, *Stachys aethiopica*, *Tragia meyeriana*, *Vernonia capensis*.

Succulent Herb: *Aloe parvibracteata*.

Biogeographically Important Taxa

Small Tree: *Acacia theronii*

Tall Shrub: *Lycium shawii*

- *FEPA wetlands and / or rivers onsite*

There are no FEPA Rivers or Wetlands on site, however there is stream present south west of the proposed project area.

6. VEGETATION ON SITE

- *General Vegetation Overview of the site*

The site of the proposed development is slightly undulating in terrain and supports thickets dominated by thorn trees such as *Searsia gueinzii*, *Ziziphus mucronata*, *Dichrostachys cinerea*, *Gymnosporia* species and *Acacia* species (**Figure 7**) along with a number of large *Schotia brachypetala* (**Figure 8**), *Euclea* species to name a few.. There were a number of indigenous creepers such as *Capparis tomentosa* and *Rhoicissus tridentata* climbing the trees in the plot (**Figure 9**). There is a small stream in the south-west portion of the site that is flanked by large *Schotia brachypetala*, *Acacia* and *Dichrostachys* species (**Figure 10**). A number of indigenous species were found

in the understorey including *Pappea capensis*, *Justicia flava*, *Carissa bispinosa* and *Asparagus setaceus* (**Figure 11**). There were a few medium sized *Sideroxylon inerme*, which are nationally protected under the Department of Agriculture, Forestry, and Fisheries (**Figure 12**).



Figure 7: Thorn veld thickets supporting (top to bottom) *Ziziphus mucronata*, *Searsia gueinzii* and *Gymnosporia buxifolia*.



Figure 8: *Schotia brachypetala* flowers and seed pods.



Figure 9: *Rhoicissus tridentata* and *Capparis tomentosa*.



Figure 10: Stream on site.



Figure 11: (Clockwise from top left) *Papea capensis*, *Justicia flava*, *Carissa bispinosa* and *Asparagus setaceus*.



Figure 12: *Sideroxylon inerme*.

A total of 34 plant species that were recorded during this field survey, one (1) was an alien plant species. Two (2) tree species that are protected by Provincial Legislation and two (2) that are protected by National Legislation

were noted within the site. The plant species that fall under the protection of the KwaZulu-Natal Nature Conservation Management Act and National legislation are listed below (Please see **Appendix 3** for the complete species list).

Provincially protected:

- *Ledebouria* sp.
- *Asparagus setaceus*

Nationally protected:

- *Sideroxylon inerme*
- *Sclerocarya birrea* subsp. *caffra*

7. Discussion

The site is completely natural bar one alien plant species (category 1), *Datura stramonium*, found at low levels within the plot (< 1% of the cover). The density of the woody vegetation cover indicates that there is a level of bush encroachment due to veld mismanagement, possibly due to the exclusion of fire or adequately hot fires when the veld is burnt, incorrect animal stocking rates and/ or the absence of mega herbivores such as elephants and black rhino. Woody species such as *Acacia* species, *Gymnosporia* species, *Euclea* species and *Spirostachys africana* are pioneer¹ species that can outcompete the grass and herbaceous layer thus reducing the overall biodiversity of the ecosystem. There were several nationally and provincially protected species on site, however none of them are considered rare and thus their removal would not be to the detriment of the species existence. The proposed development will comprise of a lodge with associated infrastructure such as ten (10) out-rooms, eating boma and swimming pool (**Figure 3 in Chapter 2 above**).

It is important to note that the site, although indicating low levels of bush encroachment, is considered to be a gazetted protected ecosystem under NEM:BA (National Gazette No 34809 of 09 December 2011). It is part of the Ecosystem called Black Rhino Range and contains the Vulnerable Zululand Lowveld vegetation type. It is also considered to be CBA: Irreplaceable under Ezemvelo's Biodiversity sector plan, thus triggering a Basic Assessment under the following NEMA regulations:

- Listing Notice 1 Activity 30: *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)* and;
- Listing Notice 3 Activity 12 (v): *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a*

¹ Pioneer woody species can occur in established ecosystems that have been reduced by an event or events such as: a fire or lack thereof, overgrazing and under stocking or exclusion of mega-herbivores; quickly colonizing open spaces which previously supported graminoid or herbaceous vegetation.

list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004).

V: Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

8. SUMMARY OF FINDINGS

Having undertaken the assessment of the proposed development footprint the following findings were noted.

- The overall area, as indicated from the desktop assessment and ground truthing, is Zululand Lowveld vegetation type, which is considered a vulnerable ecosystem as it makes up protected gazetted ecosystem call the Black Rhino Range;
- Provincially and Nationally protected trees and bulbous species were present on site;
- The site is slightly degraded due to bush encroachment;
- Although the current species assemblage recorded across the site is indicative of bush encroachment, there are however, relatively high numbers of nationally and provincially protected plants and less than <1% alien plants present;
- The development of the site would trigger a Basic Assessment process under the NEMA regulations (Listing Notice 1 Activity 30 and Listing Notice 3 Activity 12 as indicated in the Discussion above).

9. RECOMMENDATIONS AND CONCLUSIONS

The species that occur within the proposed developable are entirely indigenous with minimal alien species present. The potential developable site is considered to be degraded based on the densities of indigenous pioneer woody species due to veld mismanagement.

It is important to mention that additional species may have been overlooked during the field survey due to the plant life history characteristics exhibited by certain plant species. Some species may not have emerged due to the time of the year (bulbs), the amount of rainfall or requisite temperature (heat units) to force emergence. However, it is our opinion that the vegetation that was recorded provides enough information in order for the specialist to make inferences and extrapolations as to the quality, and the likely impacts associated with a development of this nature.

It is strongly recommended that if development takes place, it is to do so only in the areas indicated on the lay out map in **Figure 3**. Should the need arise for indigenous trees to be cut and / or destroyed in the developable area, a DAFF permit will need to be obtained. The permit and application will need to be made and an offset for the loss of these individuals will be required, usually planting 5 individuals of the same species for each tree that will be lost. These trees could be retained as part of the indigenous landscaping.

If relocation/ removal of some of the provincially protected species is required, a permit for their removal will need to be obtained by Ezemvelo KZN Wildlife. Their removal and should occur during the summer months and

with due care, preferably by a qualified botanist or similarly qualified individual. The plants should be relocated into areas with the same aspect, soil conditions and elevation to ensure that the relocations are successful.

However, if the current layout is not deviated from, it is unlikely that many indigenous trees would need to be removed as they can be retained in the landscaping. Any applicable approvals/permits/consents/licenses relating to the environment should be in place prior to any site clearing and development.

Should any development take place it is to do so in the areas indicated on the map in **Figure 3**, the following is recommended but not limited to:

- Alien plants should be removed and managed, preferably mechanically and not chemically so as to have minimal ecological and biological impacts- for example near the stream;
- Special attention should be given to protecting and enhancing the existing natural vegetation on site by incorporating the already established trees on site as part of the landscaping of the development;
- In the event that any natural vegetation is required to be removed or destroyed, a vegetation specialist should be appointed to assist with the identification, recovery and relocation of the plant species by way of DAFF and Ezemvelo KZN Wildlife permit applications.

The vegetation ecologist has no concern over the development providing the above mentioned recommendation are considered, and an environmental management plan adhered to ensure best environmental practice, especially with regards to construction stage impacts and construction and operational stages storm water impacts. Good housekeeping and management of the construction and operational impacts will have very limited impacts on the current environment.

10. REFERENCES

1. **Camp, K.G.T. (1998).** The Bioresource Units of KwaZulu-Natal. Cedara Report N/A/95/32. KZN Department of Agriculture. Pietermaritzburg.
2. **Department of Environmental Affairs and Tourism (DWAF). (2001).** Environmental Potential Atlas for South Africa. Source: www.environment.gov.za/enviro-info/enpat.htm.
3. **Ezemvelo KZN Wildlife (2003).** KZN Natural Heritage Sites 2003. Unpublished GIS Coverage [kznnhs03_wll], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P.O. Box 13053, Cascades, Pietermaritzburg, 3202.
4. **Ezemvelo KZN Wildlife (2010).** Macro Ecological Corridors, Version 3. . Unpublished GIS Coverage [kzncor05v310_wll], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
5. **Ezemvelo KZN Wildlife (2010).** Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
6. **Ezemvelo KZN Wildlife (2011).** EKZNW Protected Area Boundaries 2011. Unpublished GIS Coverage [kznpabnd11], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
7. **Ezemvelo KZN Wildlife (2014).** KZN Biodiversity Spatial Planning Terms and Processes, Version 3. Unpublished Report, Biodiversity Spatial Planning and Information Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
8. **Goodman, P.S. (ed) (2000).** Determining the conservation value of land in KwaZulu-Natal. Biodiversity Conservation Planning Division, *Ezemvelo* KZN Wildlife, P.O. Box 13053, Cascades, Pietermaritzburg, 3202.
9. **International Union for Conservation of Nature (IUCN) (2014).** The IUCN Red List of Threatened Species. Version 2014.1.
10. **Mucina, L., Rutherford, M.C. & Powrie, L.W. (eds) (2007).** Vegetation Map of South Africa, Lesotho and Swaziland, Edition 2, 1:1 000 000 scale sheet maps. South African National Biodiversity Institute, Pretoria. ISBN 978-1-919976-42-6.
11. **Pooley, E. (1997)** A complete field guide to trees of Natal, Zululand and Transkei. Natal Flora Publications Trust. Durban, South Africa.
12. **Pooley, E. (1998).** A field guide to wildflowers of KwaZulu-Natal and the eastern region. Natal Flora Publications Trust. Durban, South Africa.
13. **Scott-Shaw, C.R. (1999).** Rare and threatened plants of KZN and neighbouring regions – a plant red data book. Pietermaritzburg Biodiversity Division, Pietermaritzburg.
14. **Scott-Shaw, C.R. and Escott, B.J. (Eds) (2011).** KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_1_11_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg,
15. **South African National Biodiversity Institute (SANBI) (2014).** National Assessment: Red List of South African Plants version 2014.1
16. **South African National Biodiversity Institute (SANBI) (2004).** **National Spatial Biodiversity Assessment: Ecosystem status of vegetation types derived from the new vegetation map of South Africa.**
17. **South African National Biodiversity Institute Plants of southern Africa: an online checklist 3.** <http://posa.sanbi.org>

18. **van Oudtshoorn, F. (1992)** Guide to grasses of South Africa. Briza Publications, Arcadia, South Africa

APPENDIX 1

Regulations and Legislation

The following protocol is extracted from the National Environmental Management Act, Act 108 of 1998 (NEMA) as amended in 2014. The relevant Section is included below:

Specialist reports and reports on specialised processes

- (1) *An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialised process.*
- (2) *The Person referred to in sub-regulation (1) must comply with the requirements of Regulation 17.*
- (3) *A specialist report or a report on a specialised process prepared in terms of these Regulations must contain –*
 - (a) *details of –*
 - (i) *the person who prepared the report; and*
 - (ii) *the expertise of that person to carry out the specialist study or specialised process;*
 - (b) *a declaration that the person is independent in a form as may be specified by the competent authority;*
 - (c) *an indication of the scope of, and the purpose for which, the report was prepared;*
 - (d) *a description of the methodology adopted in preparing the report or carrying out the specialised process;*
 - (e) *a description of any assumptions made and any uncertainties or gaps in knowledge;*
 - (f) *a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;*
 - (g) *recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;*
 - (h) *a description of any consultation process that was undertaken during the course of carrying out the study;*
 - (i) *a summary and copies of any comments that were received during any consultation process; and*
 - (j) *any other information requested by the competent authority.*

In addition there are various Sections of the legislation that would be applicable to the proposed development and / or the land as it currently is.

- **NATIONAL ENVIRONMENTAL MANAGEMENT ACT, ACT NO. 107 OF 1998 (NEMA)**

NEMA requires, *inter alia*, that:

“Development must be socially, environmentally, and economically sustainable”,

“Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.”

“A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions”,

NEMA also states that;

“The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage.”

- **NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)**

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected.

The prohibitions provide that;

“No person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.”

Any disturbance, removal, pruning or transplanting of these species would require a licence from the administrators of the National Forests Act, who are an extension of the Department of Agriculture, Forestry and Fisheries (DAFF) based in Pietermaritzburg.

6.

7.

8.

8.1.

8.2.

- *Permit / Licence requirements*

In terms of the National Forests Act, 1998 (Act No. 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No. 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a license.

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KZN the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from *Ezemvelo KZN Wildlife* to remove or destroy any plants listed in the Ordinance. However, the list for Specially Protected Species in KwaZulu-Natal was (1974) has become very difficult to interpret and to apply to the plant species recorded during vegetation surveys. This is because of major taxonomic changes in the petaloid monocots. It must be noted that this list is in urgent need of an update. Therefore subjective decisions regarding a species protection status have to be taken which may not always be in agreement with the 1974 Ordinance.

- **NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO. 10 OF 2004)**

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

- **CONSERVATION OF AGRICULTURAL RESOURCES (ACT NO. 43 OF 1983) AS AMENDED IN 2001**

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

Category 1 *plants: are prohibited and must be controlled.*

Category 2 *plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.*

Category 3 *plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.*

APPENDIX 2

Methodologies

- **EZEMVELO KZN WILDLIFE C-PLAN & SEA DATABASE**

The C-Plan is a systematic conservation-planning package that runs with the GIS software ArcGIS, and which analyses biodiversity features and landscape units. C-Plan is used to identify a national reserve system that will satisfy specified conservation targets for biodiversity features (*Ezemvelo KZN Wildlife, 2010*). Biodiversity features can be land classes or species, and targets are set within area units either for land classes, or as numbers of occurrences of species for species locality data sets (*Ezemvelo KZN Wildlife, 2010*). These units or measurements are used as surrogates for un-sampled data. The C-Plan is an effective conservation tool when determining priority areas at a regional level and is being used in South Africa to identify areas of high conservation value. The SEA (**Goodman, 2004**) modelled the distribution of a selection of 255 red data and endemic species that have the potential to occur in the area.

- *Irreplaceability Analysis*

The following is referenced from **Goodman (2004)**:

The first product of the conservation planning analysis in C-Plan is irreplaceability map of the planning area, in this case the province of KwaZulu-Natal. This map is divided into grid cells called 'Planning Units'.

Each planning unit has associated with it an 'Irreplaceability Value', which is a reflection of the planning units' importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning unit's ability to meet set 'targets' for selected biodiversity 'features'. The irreplaceability value is scaled between 0 and 1.

Irreplaceability value – 0. Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site.

Irreplaceability value – 1. These planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. (EIA very definitely required and depending on the nature of the proposal unlikely to be granted).

Irreplaceability value > 0 but < 1. Some of these planning units are still required to meet biodiversity conservation targets. If the value is high (e.g. 0.9) then most units are required (few options available for alternative choices). If the value is low, then many options are available for meeting the biodiversity targets. (EIA required and depending on the nature of the proposed development, permission could be granted)."

The irreplaceability units have been optimised further to create various subcategories called *Critical Biodiversity Areas* and *Ecological Support Areas* (*Ezemvelo KZN Wildlife, 2014*).

○ *Critical Biodiversity Areas*

Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely *Irreplaceable* and *Optimal*. Each of these can in turn be subdivided into additional subcategories (**Table 1**). The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved.

The distribution of the biodiversity features is not always applicable to the entire extent of the PU, but is more often than not confined to a specific niche habitat e.g. a forest or wetland reflected as a portion of the PU in question. In such cases, development could be considered within the PU if special mitigation measures are put in place to safeguard this feature(s) and if the nature of the development is commensurate with the conservation objectives. Obviously this is dependent on a site by site, case by case basis.

Using C-Plan, areas are identified through the MINSET analysis process and reflect the negotiable sites with an Irreplaceability score of less than 0.8. Within the C-Plan MINSET analysis this does not mean they are of a lower biodiversity value. It simply means more options are available for the safeguarding of sensitive or important features over and above the required conservation targets (e.g. 30% of a certain vegetation type remains and the conservation target is 25%). The determination of the spatial locality of these PU's is driven primarily by the Decision Support Layers.

Table 4. Summary of CBA Categories (from *Ezemvelo KZN Wildlife, Biodiversity Spatial Planning Terms*).

Category	C-Plan	MARXAN	Expert Input/ Desktop	Biodiversity Sector and Regional Plans
CBA: Irreplaceable (SCA)	Irreplaceability = 1	No equivalent		CBA: Irreplaceable
CBA: High Irreplaceable(SCA)	Irreplaceability Score >= 0.8 and <1.0	Selection frequency value = 80% –100%		CBA: Irreplaceable
CBA: Irreplaceable Expert Input			Expert input	CBA: Irreplaceable
CBA: Irreplaceable Linkage			Desktop and expert input	CBA: Irreplaceable
CBA: Optimal (SCA)	Irreplaceability Score > 0 and < 0.8	“Best” solution from MARXAN runs less the identified CBA High Irreplaceability areas		CBA: Optimal
CBA: Optimal, High Degradation	Irreplaceability Score > 0 and < 0.8	“Best” solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Low Degradation	Irreplaceability Score > 0 and < 0.8	“Best” solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Expert Input			Expert input	CBA: Optimal

○ *Ecological Support Areas*

Ecological Support Areas (ESAs) are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not

necessarily pristine natural areas. They are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and contribute significantly to the maintenance of Ecological Infrastructure² (EI).

- *Landscape Corridors*

A series of bio-geographic corridors were created in KZN to facilitate evolutionary, ecological and climate change processes to create a linked landscape for the conservation of species in a fragmented landscape.

- *Local Corridors*

Corridors were developed at a district scale to create fine scale links within the landscape that facilitate ecological processes and ensure persistence of critical biodiversity features.

- **BIO RESOURCE UNITS (BRU)**

A Bioresource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions (Camp, K.G.T. 1998).

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. There are 590 BRUs in KwaZulu-Natal.

- **ENVIRONMENTAL POTENTIAL ATLAS**

The following is referenced from the Department of Environmental Affairs and Tourism (2007): The Environmental Potential Atlas (ENPAT) developed from a single map of Gauteng to a complete spatial data set of the entire South Africa.

² A term referring to areas in the landscape which provide significant Ecosystem Services which contribute positively to the economy and human welfare. Examples include 'Flood mitigation' and 'Good Water Quality' (provided both by wetlands and well maintained water catchments). Ecological infrastructure is the stock of functioning ecosystems that provides a flow of essential system services to human communities – services such as the provision of fresh water, climate regulation and soil formation. Ecological infrastructure includes features such as healthy mountain catchments, rivers, wetlands, and nodes and corridors of natural grassland habitat which together form a network of interconnected structural elements within the landscape. If this ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish and ecosystems will become vulnerable to shocks and disturbances, such as the impacts of climate change, unsustainable land use change and natural disasters like floods and droughts. It is important to note that when ecological infrastructure is degraded or fails, the direct monetary cost to society and government is often very high. Ecological infrastructure is, therefore, the nature-based equivalent of hard infrastructure, and is just as important for providing the vital services that underpin social development and economic activity.

ENPAT was updated in July 2001 and is used by the National Department of Environmental Affairs and Tourism and various provincial environmental management departments as a decision-making tool in the process of environmental impact assessments. ENPAT includes the decision-making parameters such as: high-risk development category indications and potential impacts are linked to the 1:250 000 spatial databases on national and provincial level.

The main purpose of ENPAT is to proactively indicate potential conflicts between development proposals and critical or sensitive environments. ENPAT can also be used for development planning since it indicates the environment's potential for development.

ENPAT consists of two distinct, parallel sets of information: natural or environmental characteristics, and social-economic factors. The environmental character maps depict geology, land types, soils, vegetation, and hydrology. The socio-economic factors consist of land cover, cadastral aspects and infrastructure, land use and culture.

These two sets of information are combined and assessed in terms of their potential or latent environmental sensitivity. Sensitivity is assigned based on the ability of a resource to absorb change or impact. A value of **0** indicates a **low sensitivity** - thus a high ability to accept change and a value of **1** indicates a **high sensitivity**, or a low ability to accept change. Areas of low sensitivity are thus available or suitable for development.

- **MUCINA AND RUTHERFORD'S VEGETATION ASSESSMENT AND KWAZULU – NATAL VEGETATION TYPES (KZN VT)**

Mucina and Rutherford present an up-to-date and comprehensive overview of the vegetation of South Africa and the two small neighbouring countries of Lesotho and Swaziland. This account is based on vegetation survey using appropriate tools of contemporary vegetation mapping and vegetation description. They aimed at drawing a new vegetation map that depicts the complexity and macro-scale ecology and reflects the level of knowledge of the vegetation of the region. This is an extensive account of the vegetation of a complex and biologically intriguing part of the world, offering not only insights into structure and dynamics of the vegetation cover, but containing a wealth of base-line data for further vegetation- ecological, biogeographical, and conservation-oriented studies. The map and the descriptive account of the vegetation of South Africa, Lesotho and Swaziland offers a powerful decision-making tool for conservationists, land and resource planners, and politicians as well as the interested public at large. KwaZulu-Natal (KZN) province is rich in natural diversity. The KZN VT was created to provide an accurate representation of the historical extent of the vegetation types present in KZN with the most current available information. A key issue of concern is our current lack of knowledge regarding the historical extents of both our wetland and forest biomes. Almost all vegetation mapping conducted currently only displays the current extent of the feature in question. As such, no true understanding as to rates of loss and or minimum required habitat areas required to ensure persistence can be accurately determined. This issue further influences our understanding of the grassland/savannah/bushland matrix within which these features reside. The KZN VT map has undergone several changes since the publication of the Mucina and Rutherford (2006) national vegetation types.

Ezemvelo KZN Wildlife has, in association with various government departments, NGOs, Working Groups and Forums, municipalities and parastatals, refined the KZN VT to develop an accurate representation of the extent of the vegetation types present. As a result of the finer scale mapping and classification, KZN VT map has in some cases identified new vegetation types and or subtypes within the vegetation types identified at national level. These changes have been peer reviewed and adopted by the National Vegetation Committee, and have been incorporated into the revised South African Vegetation map.

- **NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPAs)**

NFEPAs was a three-year partnership project between South African National Biodiversity Institute (SANBI), CSIR, Water Research Commission (WRC), Department of Environmental Affairs (DEA), Department of Water Affairs (DWA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks) (**Van Deventer *et al.* 2010**). NFEPAs map products provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs.

FEPAs maps and supporting information form part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources. They provide a single, nationally consistent information source for incorporating freshwater ecosystem and biodiversity goals into 2 planning and decision-making processes. For integrated water resource management, the maps provide guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act No. 36 of 1998; RSA, 1998a). FEPAs maps are therefore directly applicable to the National Water Act, feeding into Catchment Management Strategies, classification of water resources, reserve determination, and the setting and monitoring of resource quality objectives. FEPAs maps are also directly relevant to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004; RSA, 2004) (hereafter referred to as the Biodiversity Act), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act. FEPAs maps support the implementation of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003; RSA, 2003) (hereafter referred to as the Protected Areas Act) by informing the expansion of the protected area network. They also inform a variety of other policies and legislation that affect the management and conservation of freshwater ecosystems, including at the municipal level.

FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for conserving ecosystems and associated biodiversity of rivers, wetlands and estuaries.

FEPAs are often tributaries and wetlands that support hard-working large rivers, and are an essential part of an equitable and sustainable water resource strategy. FEPAs need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean that FEPAs need to be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem. The current and

recommended condition for all river FEPAs is A or B ecological category. Wetland FEPAs that are currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.

APPENDIX 3

Species List

Species Name	Common name	Status	Growth form
<i>Asparagus setaceus</i> (Kunth) Jessop	Common Asparagus Fern	Protected	Herb
<i>Berchemia zeyheri</i> (Sond.) Grubov	Red Ivory	Indigenous	Tree
<i>Capparis sepiaria</i> L. var. <i>citrifolia</i> (Lam.) Toelken	Cape capers	Indigenous	Climber
<i>Capparis tomentosa</i> Lam.	Woolly caper bush	Indigenous	Climber
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Num-Num	Indigenous	Tree
<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Sickle bush	Indigenous	Tree
<i>Distephanus</i> Cassini sp.		Indigenous	Climber
<i>Dovyalis caffra</i> (Hook.f. & Harv.) Hook.f.	Kei-apple	Indigenous	Shrub
<i>Ehretia rigida</i> (Thunb.) Druce	Puzzle bush	Indigenous	Tree
<i>Euclea daphnoides</i> Hiern	White Guarri	Indigenous	Tree
<i>Euclea divinorum</i> Hiern	Magic Guarri	Indigenous	Tree
<i>Euclea undulata</i> Thunb.	Small-leaved Guarri	Indigenous	Tree
<i>Gymnosporia buxifolia</i> (L.) Szyszyl.	Common spike-thorn	Indigenous	Tree
<i>Gymnosporia senegalensis</i> (Lam.) Loes.	Red Spike-Thorn	Indigenous	Tree
<i>Justicia flava</i> (Vahl) Vahl	Yellow Justicia	Indigenous	Herb
<i>Kigelia africana</i> (Lam.) Benth.	Sausage Tree	Indigenous	Tree
<i>Ledebouria</i> Roth sp.	Common Squill	Protected	Bulb
<i>Maytenus undata</i> (Thunb.) Blakelock	South African Holly	Indigenous	Tree
<i>Ozoroa paniculosa</i> (Sond.) R.Fern. & A.Fern.	Common Resin Tree	Indigenous	Tree
<i>Pappea capensis</i> Eckl. & Zeyh.	Jacket plum	Indigenous	Tree
<i>Rhoicissus tridentata</i> (L. f.) Wild & R.B. Drumm.	Bushman's grape	Indigenous	Climber
<i>Schotia brachypetala</i> Sond.	Weeping boer-bean	Indigenous	Tree
<i>Sclerocarya birrea</i> (A.Rich.) Hochst. subsp. <i>caffra</i> (Sond.) Kokwaro	Marula tree	Protected	Tree
<i>Searsia gueinzii</i> (Sond.) F.A.Barkley	Thorny Karee	Indigenous	Tree
<i>Searsia nebulosa</i> (Schönland) Moffett forma <i>nebulosa</i>	Karee	Indigenous	Tree
<i>Senegalia nigrescens</i> (Oliv.) P. J. H. Hurter (= <i>Acacia nigrescens</i> Oliv.)	Knobthorn	Indigenous	Tree
<i>Sideroxylon inerme</i> L. subsp. <i>inerme</i>	White milkwood	Protected	Tree
<i>Spirostachys africana</i> Sond.	Tamboti	Indigenous	Tree
<i>Vachellia gerrardii</i> (Benth.) P.J.H.Hurter subsp. <i>gerrardii</i> (= <i>Acacia gerrardii</i>)	Engelse Doring	Indigenous	Tree
<i>Vachellia robusta</i> (Burch.) Kyalangalilwa & Boatwright subsp. <i>robusta</i> (= <i>Acacia robusta</i> Burch.)	Broadpod robust thorn	Indigenous	Tree
<i>Vachellia tortilis</i> subsp. <i>heteracantha</i> (Burch.) Kyal. & Boatwr. (= <i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>heteracantha</i> (Burch.) Brenan)	Umbrella thorn	Indigenous	Tree
<i>Vachellia xanthophloea</i> (Benth.) P.J.H.Hurter (= <i>Acacia xanthophloea</i>)	Fever tree	Indigenous	Tree
<i>Ziziphus mucronata</i> Willd. subsp. <i>mucronata</i>	Buffalo thorn	Indigenous	Tree
<i>Datura stramonium</i> L.	Jimson weed	Alien	Herb